AMENDMENTS TO CLAIMS

1) (**Currently Amended**) A file system on a computer handling <u>file</u> read and <u>file</u> write requests to a SAN-attached storage device comprising:

    a) a local component that communicates with the SAN-attached storage device over a storage area network <u>and that interprets metadata stored on the SAN-attached storage device;</u>

    b) a NAS server that communicates with the SAN-attached storage device over a storage area network;

    c) a remote component that communicates with the NAS server over a local area network;

    d) an upper level component that communicates with application programs, the upper level component submitting all <u>file</u> write requests to the remote component and submitting at least some <u>file</u> read requests to the local component.

2) (**Original**) The file system of claim 1), wherein each of the components are separate file systems in which the upper level component file system is layered above the local component file system and the remote component file system.

3) (**Original**) The file system of claim 2) utilizing an installable file system interface to facility layering between the file systems.

4) (**Currently Amended**) The file system ~~interface~~ of claim 3) is the Virtual File System interface.

5) (**Original**) The file system of claim 2), wherein the remote component file system utilizes a protocol chosen from among the following set: Network File System, Server Message Block, and Common Internet File System.

6) (**Original**) The file system of claim 1), wherein the upper level component and the local component are merged into a single file system, and further wherein the remote component is a separate file system layered under the single file system containing the upper level and local components.

7) (**Original**) The file system of claim 1), wherein the upper level component submits all read requests to the local component.

8) **(Original)** The file system of claim 1), wherein the upper level component submits read requests above a certain size to the local component, and read requests below the certain size to the remote component.

9) **(Original)** The file system of claim 1), wherein the upper level component submits read requests to the local component if the file size is above a certain size, and the upper level component submits read requests to the remote component if the file size is below the certain size.

10) **(Original)** The file system of claim 1), wherein the upper level component submits all read request to the local component except where the local component is not capable of properly retrieving data requested in the read request, in which case the upper level component submits the read request to the remote component.

11) **(Original)** The file system of claim 10), wherein the upper level component determines whether the local component is capable of properly retrieving data requested in the read request by comparing modification times for a file indicated in the read request as retrieved from the remote component and the local component.

12) **(Original)** The file system of claim 11), further wherein the upper level component determines whether the local component is capable of properly retrieving data requested in the read request by comparing modification times for a directory indicated in the read request as retrieved from the remote component and the local component.

13) **(Original)** The file system of claim 12), wherein the directory modification times are compared during a lookup function, with the results stored in an inode structure for the higher-level component.

14) **(Original)** The file system of claim 13), wherein the inode structure for the higher-level component includes the following:

    a)   a handle pointing to a file vnode for the remote component;

    b)   a handle pointing to a file vnode for the local component;

    c)   a remote modification time indicating the modification time returned by the remote component; and

d) a local modification time indicating the modification time returned by the local component.

15) **(Original)** The file system of claim 1), wherein the file system is capable of handling additional file requests, with file requests that alter data on the SAN-attached storage device being treated similar to the write requests, and file requests that do not alter data on the SAN-attached storage device being treated similar to the read requests.

16) **(Currently Amended)** The ~~method~~ file system of claim 1), further comprising a file server component capable of receiving and responding to file requests from other computers that are connected to the local area network but not connected to the storage area network.

17) **(Original)** A network of connected computing devices comprising:

a) a local area network;

b) a storage area network;

c) a SAN-attached device attached to the storage area network;

d) a server computer attached to the local area network and the storage area network; the server computer receiving file requests across the local area network and further storing real data on the SAN-attached device via the storage area network; and

e) at least one client computer attached to the local area network and the storage area network; the client computer having:

i) a remote file system in communication with and making file requests to the server computer over the local area network;

ii) a local file system in communication with the SAN-attached device over the storage area network;

iii) an upper level file system serving file requests from an application program operating on the client computer, the upper level file system dividing the file requests from the application program between the remote file system and the local file system.

18) **(Original)** The network of claim 17), wherein the upper level file system submits all file requests having data sizes above a certain size to the SAN-attached device

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over the storage area network via the local file system and all file requests having data sizes below a certain size to the server computer over the local area network via the remote file system.

19)   (**Original**) The network of claim 17), wherein the upper level file system submits all file requests to the SAN-attached device over the storage area network via the local file system if the file size is above a certain size, and the upper level file system submits all file requests to the server computer over the local area network via the remote file system if the file size is below the certain size.

20)   (**Original**) The network of claim 17), wherein file requests comprise write requests and read requests, and the upper level file system submits all write requests to the server computer over the local area network via the remote file system, and at least some of the read requests to the SAN-attached device over the storage area network via the local file system.

21)   (**Original**) The network of claim 20), wherein the upper level component submits all read requests having data sizes above a certain size to the SAN-attached device via the local file system, and further wherein the upper level component submits all read requests having data sizes below a certain size to the server computer via the remote file system.

22)   (**Original**) The network of claim 20), wherein the upper level component submits all read requests through the local file system except where the local file system is not capable of properly retrieving data requested in the read request, in which case the upper level component submits the read request to the remote file system.

23)   (**Original**) The network of claim 22), wherein the upper level component determines whether the local file system is capable of properly retrieving data requested in the read requests by comparing modification times received from the local file system with modification times received from the remote file system.

24)   (**Original**) The network of claim 20), further comprising a plurality of additional client computers, wherein, in relation to the client computers, only the server computer is granted write access to the SAN-attached device and further

wherein all write requests from the client computers are routed via the remote file systems in the client computers to the server computer.

25) **(Original)** The network of claim 24), wherein the SAN-attached device is a single logical device comprised of multiple physical devices.

26) **(Original)** The network of claim 24), wherein the server computer is comprised of multiple physical computers operating as a single logical server cluster.

27) **(Original)** The network of claim 17), wherein the SAN-attached device is a single logical device comprised of multiple physical devices.

28) **(Original)** The network of claim 17), wherein the server computer is comprised of multiple physical computers operating as a single logical server cluster.

29) **(Original)** The network of claim 17), wherein the SAN-attached device and the server computer together comprise a single SAN appliance.

30) **(Original)** The network of claim 17), wherein the local file system and the upper level file system are merged into a single file system having the capabilities of the local and upper level file systems.

31) **(Original)** The network of claim 17), wherein the local file system, the remote file system, and the upper level file system are merged into a single file system having the capabilities of the separate local, remote, and upper level file systems.

32) **(Original)** The network of claim 17), wherein the server computer uses a server local file system to communicate with the SAN-attached device, and further wherein the local file system operating on the client computer and the server local file system are the same file system.

33) **(Original)** The file system of claim 17), wherein the client computer further has a file server file system that receives and responds to file requests from additional computers that are connected to the local area network but not connected to the storage area network.

34) **(Original)** A method for handling file requests for an application, the file requests relating to real data stored on a SAN-attached device, the method comprising:

a)   receiving the file requests from the application;

b) analyzing the file requests to determine whether the request is a local request, and hence should be handled through direct access to the SAN-attached device over a storage area network, or whether the request is a remote request, and should be handled by a server computer accessible by a local area network, with the server computer handling direct access to the SAN-attached device;

c) submitting local requests to the SAN-attached device over the storage area network and then receiving a local response to the file request over the storage area network;

d) submitting remote requests to the server computer over the local area network and then receiving a remote response to the file request over the local area network;

e) relaying the responses to the application.

35) **(Original)** The method of claim 34), wherein local requests are submitted by a local file system, and remote requests are submitted by a remote file system.

36) **(Currently Amended)** The method of claim 34), wherein the step of analyzing the file requests further comprises:

    i) determining whether the file requests ~~modifies~~ modify the SAN-attached device;

    ii) treating file requests that modify the SAN-attached device as remote requests; and

    iii) treating at least some of the file requests that do not modify the SAN-attached device as local requests.

37) **(Original)** The method of claim 36), wherein local requests are handled by a local file system having a cache, and further wherein remote requests are handled by a remote file system having a cache.

38) **(Original)** The method of claim 37), wherein the step of analyzing the file requests further comprises:

    iii) determining whether file requests that do not modify the SAN-attached device can be fulfilled through the local file system;

iv)   treating file requests that do not modify the SAN-attached device and can be fulfilled through the local file system as local requests; and

v)   treating the remaining file requests as remote requests.

39)   **(Original)** The method of claim 37), wherein the step of determining whether file requests can be fulfilled through the local file system further comprises:

(1)   determining a file involved in the file requests;

(2)   retrieving a modification time for the file from the local file system;

(3)   retrieving a modification time for the file from the remote file system; and

(4)   comparing the local and remote modification times.

40)   **(Original)** The method of claim 39), wherein the step of determining whether file requests can be fulfilled through the local file system further comprises:

(5)   invalidating the local file system cache when the two modification times are not identical.

41)   **(Original)** The method of claim 39), wherein the step of determining whether file requests can be fulfilled through the local file system further comprises:

(6)   obtaining a new modification time from the local file system after the local file system cache has been invalidated;

(7)   comparing the new local modification time with the remote modification time in a second comparison;

(8)   treating the file request as a local request if the second comparison finds the modification times to be identical; and treating the file request as a remote request if the second comparison does not find the modification times to be identical.

42)   **(Original)** The method of claim 41), further comprising the step of performing a lookup function to create an inode for the file, the inode having a remote handle pointing to a remote vnode for the file and a local handle pointing to a local vnode for the file, the remote and local vnodes being used to identify the file in the remote and local file systems, respectively.

43)   (**Original**) The method of claim 42), wherein the step of performing a lookup function compares modification times for the directory containing the file in both the remote and local file systems to determine whether the local file system access should be allowed.

44)   (**Original**) The method of claim 43), wherein a lookup routine is performed for the file for both the local and remote file systems, and further wherein, if the remote file system does not find the file, a file not found result is returned to the application.

45)   (**Original**) The method of claim 44), wherein if the local file system does not find the file, the remote file system is used to service file requests.

46)   (**Currently Amended**) A network of connected computing devices comprising:

a)   a local area network;

b)   a storage area network;

c)   a SAN-attached device attached to the storage area network;

d)   a server computer attached to the local area network and the storage area network; the server computer receiving file requests across the local area network and further storing and retrieving data on the SAN-attached device via the storage area network; and

e)   at least one client computer attached to the local area network and the storage area network; the client computer having:

  i)   a remote component in communication with and making file requests to the server computer over the local area network;

  ii)   a local component in communication with <u>and making metadata and real-data requests to</u> the SAN-attached device over the storage area network;

  iii)   an upper level component serving file requests from an application program operating on the client computer, the upper level component dividing the file requests from the application program between the remote component and the local component.

47)   (**Original**) The network of claim 46), wherein the upper level component submits all file requests having data sizes above a certain size to the SAN-attached device

over the storage area network via the local component and all file requests having data sizes below a certain size to the server computer over the local area network via the remote component.

48) **(Original)** The network of claim 46), wherein the upper level component submits all file requests to the SAN-attached device over the storage area network via the local component if the file size is above a certain size, and the upper level component submits all file requests to the server computer over the local area network via the remote component if the file size is below the certain size.

49) **(Original)** The network of claim 46), wherein file requests comprise write requests and read requests, and the upper level component submits all write requests to the server computer over the local area network via the remote component, and at least some of the read requests to the SAN-attached device over the storage area network via the local component.

50) **(Original)** The network of claim 49), wherein the upper level component submits all read requests having data sizes above a certain size to the SAN-attached device via the local component, and further wherein the upper level component submits all read requests having data sizes below a certain size to the server computer via the remote component.

51) **(Original)** The network of claim 49), wherein the upper level component submits all read requests to the SAN-attached device via the local component if the file size is above a certain size, and further wherein the upper level component submits all read requests to the server computer via the remote component if the file size is below the certain size.

52) **(Original)** The network of claim 49), wherein the upper level component submits all read requests through the local component except where the local file system is not capable of properly retrieving data requested in the read request, in which case the upper level component submits the read request to the remote component.

53) **(Original)** The network of claim 52), wherein the upper level component determines whether the local component is capable of properly retrieving data requested in the read requests by comparing modification times received from

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the local component with modification times received from the remote component.

54) (**Original**) The network of claim 49), further comprising a plurality of additional client computers, wherein, in relation to the client computers, only the server computer is granted write access to the SAN-attached device and further wherein all write requests from the client computers are routed via the remote component in the client computers to the server computer.

55) (**Original**) The file system of claim 46), wherein the client computer further has a file server component that receives and responds to file requests from additional computers that are connected to the local area network but not connected to the storage area network.

56) (**New**) A system handling read and write file requests from an application, the read and write requests relating to real-data, the system comprising:

a) a client computer;

b) a server computer;

c) a SAN-attached storage device for storing the real-data, the SAN-attached storage device being connected to the client computer and the server computer via a storage area network;

d) client software on the client computer that receives read and write file requests from the application, wherein the client software

 i) submits write file requests and the related real-data to the server via local area network protocols, and

 ii) receives real-data relating to the read request directly from the SAN-attached storage device; and

e) server software on the server computer, wherein the server software

 i) receives the write requests and the related real-data from the client computer, and

 ii) submits real-data related to the write requests to the SAN-attached storage device for storage.

57) (**New**) The system of claim 56), wherein the client software further comprises:

an upper level component that handles communications with the
application,

a local component that communicates with the SAN-attached storage
device, and

a remote component that communicates with the server software on the
server computer;

wherein the upper level component submits read requests to the local
component and receives real-data from the local component, and

wherein the upper level component submits write requests and related
real-data to remote component for transmission to the server
computer.

58) (**New**) The system of claim 56), wherein the client software submits all write
requests to the server and receives real-data relating to all of the read requests
directly from the SAN-attached storage device.

59) (**New**) The system of claim 56), wherein the client software submits all write
requests to the server using local area network protocols passed by physical
connections forming the storage area network.

60) (**New**) The file system of claim 1), wherein the upper level component requests
file attributes from the NAS server and uses the file attributes to determine if a
file read request can be sent to the local component.

61) (**New**) The file system of claim 1), wherein the upper level component submits
some file read requests to the local component without communicating with the
NAS server.

62) (**New**) The network of claim 17), wherein the local file system submits metadata
and real-data requests to the SAN-attached device over the storage area network.